

filled up with deposits from other vials. In shallow places *Sphagnum*, *Utricularia*, *Myriophyllum*, or other finely cut-leaved water-plants should be lifted in the hand, and the water drained or squeezed from them into a tin can, to be subsequently treated in the same way. A few drops of carbolic acid in each vial, just enough to make its presence perceptible, will preserve the contents for months, and even years, from deterioration; the chlorophyll may fade, but this, in the case of Desmids, is of little importance; nevertheless, when practicable, always examine the materials when fresh. When dried on paper for the herbarium, the specimen can still, after being moistened with water, be examined under the microscope, but not with the best results, since the drying up is apt to collapse or otherwise distort the cells.

The collector will not know the value of his find until it has been brought, drop by drop, under the microscope; and out of the entire mass he may discern nothing to reward his labours. This, however, should not discourage him, as one or two failures are to be expected before meeting with an adequate reward. Sketches ought to be made, which should, of course, be very exact; and for this purpose the microscope should be provided with an eye-piece micrometer. It is so difficult to separate Desmids from their accompanying foreign matters, that it is seldom amateurs can mount them satisfactorily on slides; and this method of preserving specimens cannot therefore be recommended.

#### RELATIVE FREQUENCY OF STORMS IN THE NORTHERN HEMISPHERE<sup>1</sup>

THE portion of the northern hemisphere selected by the Signal Office of the United States for this discussion is necessarily that part for which the data required are available, and it may be considered as comprising a broad belt of from 30° to 40° of latitude in width, extending from the Pacific sea-board of America, through the United States, Canada, the Atlantic, and Europe, with the North of Africa, eastward into Western Siberia. It thus embraces some of the more important regions of the globe, including the great routes of commerce across the Atlantic. The thirteen charts, which show graphically the relative storm frequency for each month and for the year, have been constructed from data referring to 134 months in all, extending from 1863 to 1883. Of the storms which occurred in this extensive region from January 1876 to August 1881, the history of 2730 is briefly summarised. Of these 413 began and ended in America; 589 began in America and ended in the Atlantic; 190 began in America and crossed the Atlantic; 326 began and ended in the Atlantic; 655 began in the Atlantic and ended in Europe; 491 began and ended in Europe; and 66 began in America and crossed the Atlantic and Europe. The important bearing of these facts on the telegraphing from America of forecasts of storms about to strike the coasts of Europe scarcely needs to be referred to further than to remark how essential it is for the usefulness of such a service that it be placed in the hands of some competent and responsible central authority in the United States, as was suggested by us in 1879 (*NATURE*, vol. xx. p. 359), and which, we believe, has been carried out.

The chart for the year shows that the region where storms occur with greatest frequency is a long belt in America of about 200 miles in width, extending from the head waters of the Red River, about 95° W. long., eastwards through the Great Lakes to the mouth of the St. Lawrence, about 70° W. long. Surrounding this is a more

extensive region where the number of storms, though not so large, is still a good way above the average; and again, surrounding this latter, is a still wider region, stretching from 105° W. long. eastward through the States and Canada, and through the Atlantic as far as 20° long. W. This is one of the most important regions of the globe as regards storms or cyclones. The excessive frequency of storms is probably due to a prevalence, during a large portion of the year, of the south-east trades, with a continuation of easterly and southerly winds into and through the Caribbean Sea and Gulf of Mexico, by which, from the superabundant vapour thus poured northward and eastward over the United States by upper and lower currents, frequent storms are originated.

Another region of considerable storm frequency extends from the south of Greenland, through Iceland and Farö, to the north of Sweden. Over this region it may be assumed that a more extended and exhaustive discussion of the storms occurring there than it has been possible to make, will reveal a greater frequency than is indicated on the chart, a supposition rendered highly probable by the frequent and extensive fluctuations of the barometer which occur in Iceland during at least three of the four seasons of the year. Of great interest is the less frequency of storms in the Spanish Peninsula and north-eastwards, through Central Europe, as far as Berlin; and the increased frequency to the southward over the northern half of the Mediterranean and the Black Sea, pointing to the important rôle played in the storms of that region by the evaporation from these seas.

This is substantially the distribution of frequency during the colder months of the year, when the larger number of storms occur. In the spring and summer months the distribution is materially altered. Thus, in April the regions of greater frequency extend further to southward in the United States and the Atlantic. It is in Europe, however, where this southing of the tracks of cyclones is most decidedly marked. At this season a broad patch is seen to overspread Ireland and England, and extend thence southward over the north of Spain, and then eastwards over nearly the whole of the south slope of Europe to near the Caspian Sea. As directly connected with the greater prevalence in spring of cyclones in Southern Europe are the east winds, which acquire at this same season their greatest virulence over the north-western part of the Continent. In summer, on the other hand, the coloured patches marking the regions of greater storm-frequency lie further to the northward than at any other season. Thus, in August, immediately to the north of 50° N. lat., there is an extensive region of greater storm-frequency, of about 900 miles in breadth, extending from about 45° W. long. to eastward as far as St. Petersburg. In this season the south of Europe is practically rainless, and storms are of extremely rare occurrence.

From the charts, the tracks usually taken by storms in different parts of the wide region under review cannot be ascertained, but can only be guessed at inferentially. It would be a great improvement if, in subsequent issues of the paper, these tracks were entered on the charts. This was done in 1882 in the "Physical Atlas of the Atlantic Ocean," prepared under the direction of Dr. Neumayer, of Hamburg. It was there shown from centres of the most frequent occurrence of low barometers, that to the west of the Mississippi is the region where most of the United States storms originate; that many of the Atlantic storms have their origin in the Gulf of St. Lawrence; and that the storms of North-Western Europe chiefly originate in mid-Atlantic and to the south-west of Iceland. The centres of low pressure also pointed to a retardation in the onward course of storms on advancing on large masses of land, as happens when storms approach the south of Greenland, the south of the British Islands, Denmark, and the Lofoten Isles. Of all storm-tracks approximately known in the northern hemisphere

<sup>1</sup> Charts of Relative Storm Frequency for a Portion of the Northern Hemisphere. Prepared, under the direction of General W. B. Hazen, Chief Signal Officer of the Army, by John P. Finley, Sergeant, Signal Corps, U.S.A. (Washington: Signal Office, 1884.)

the most frequently taken is that by the storms of the United States, which pursue an easterly course through the lakes to the Gulf of St. Lawrence. A considerable number advance from Nova Scotia to Davis Straits, but the greater number take a north-easterly course through the Atlantic towards Iceland and the North Cape. Among other tracks less frequently followed, but of great importance commercially and otherwise, are these: from New Orleans, along the east coast of the United States, towards Nova Scotia; from mid-Atlantic to the south of Ireland, and thence through Europe to the northern shore of the Mediterranean, and from the Atlantic about 42° lat. and 40° long., in a north-easterly course, quite outside, but at no great distance from, the British Isles, and thence towards the North Cape. Of the tracks more immediately influencing British weather, are one from Iceland in a south easterly direction through the North Sea and Germany, and three tracks starting from near Sicily, one eastward through the north of Germany, the second to the north-east to Christiania, and the third through Ireland and the Hebrides, these being the storm-tracks which chiefly give the British Islands their easterly and northerly winds. Gen. Hazen's charts suggest valuable hints as to the times of the year when these and other important routes are most frequently taken by storms.

#### THE U.S. FISH COMMISSION AT WOOD'S HOLL<sup>1</sup>

THE summer head-quarters of the United States Fish Commission is located at Wood's Holl, a village situated on the south side of Cape Cod, Mass., north of Martha's Vineyard. The coast scenery is pretty, and inland the country is undulating and partially clothed with forests of pines and other trees, which have mostly been planted within the last forty years. Wood's Holl and the neighbourhood is an increasingly favourite locality for the summer residences of the inhabitants of Boston, New Haven, New York, and other large towns in that part of the country, and already a colony of scientific men is making its appearance. Excursion steamers run frequently in the summer for the day trip from Newport and other places. As in the whole of that region of North America, the surface-soil is a thick deposit of glacial drift containing numerous boulders.

The site was selected on account of the purity of the water, owing to the absence of all fresh-water streams and presence of strong tidal currents which ensure a circulation of well-aërated water close to the shore, and also on account of the physical conditions which lead to a remarkable variety in the marine fauna being procurable within a short distance.

The warm current of the Gulf Stream, which sweeps up the eastern coast of the States, here becomes diverted by Cape Cod, and passes out into the Atlantic. This causes the pelagic fauna to be well represented, and were the local conditions of the coast more favourable it would cause the littoral fauna to be particularly rich. The cold currents from the north extend down the coast as far south as Cape Cod, which practically forms the southern limit of the Arctic littoral fauna. The narrow neck of the Cape thus separating two entirely distinct assemblages of animal forms. Lastly, the deep sea offers its peculiar fauna.

The site occupied by the Commission consists of a small spit of land, which was purchased by public subscription, and which has since been increased by reclamation.

At the present time the buildings of the Fish Commission are in a transition state. Formerly, the various

officers had to severally obtain what accommodation they could in the village. Last August, however, the staff moved into the residence-house which has been built for that purpose. The residence-house is a red brick, gabled structure, with plenty of outside woodwork, a style of architecture which is very common in New England. On the ground-floor is a large central hall, into which open Prof. Baird's office, the sitting-room, dining-hall, reading-room, and other offices. A portion of the first floor is reserved for Prof. Baird and his family, the remainder is devoted to the bedrooms of the married officers who have brought their wives—families to the extent of one baby only are allowed! The bachelors' rooms are on the second floor. The whole building is most comfortably furnished. All the staff take their meals together with the ladies.

Hitherto the summer work of the naturalists has been carried on in two roughly-fitted barns. One serves mainly as a storehouse for the trawls, collecting implements, and jars and bottles for preserving specimens. Here also is the laboratory where the chemical investigations on the water obtained at various depths and from different localities are carried on.

The other building, which is on the wharf of the Light-house Board, is mainly devoted to the temporary storage of the zoological collections and to the work-tables of the naturalists, all the fixtures are of a very simple character, and call for no special mention. It is here that the material brought in by the steamers is finally sorted and, as far as possible, determined and catalogued; the material collected, however, affords more than enough occupation for the winter months.

A commodious new laboratory is being built close to the residence house, which is expected to meet all the requirements of this most important section of the Commission. It will be a plain three-storied brick building, in the basement of which will be large tanks. The ground-floor will be thrown open to the public as a general aquarium, in which will be tanks of various sizes for the illustration of the marine fauna and for the breeding of fish, much as in our ordinary aquaria. The first floor will be devoted to the laboratories of the working naturalists, to which of course the general public will not be admitted. The second floor will be divided between the physical and physiological laboratories, photographic room, and other work rooms.

Between this building and the residence-house is the pumping-station, by means of which fresh and salt water can be continuously circulated throughout either building.

On the sea-frontage several large open basins or tanks are nearly completed, in which fish-hatching will be carried on on an extensive scale. Cod-hatching is to be tried next season. The tanks are large enough to breed sharks, were they required. The water in these tanks rises and falls with the tide, owing to the porosity of the outer walls and the existence of small gratings; the latter are, however, under perfect control. Prof. Verrill has suggested that it would be desirable to have a kind of iron and glass cage or diving-box made, which, while open above, could be let down into the largest tank, and in which a person could observe and sketch the marine life around him under the most favourable conditions.

A long wharf has also been constructed for the use of the steamers of the Commission, and which also serves as a breakwater.

The general scheme of the buildings leaves little to be desired, and doubtless many improvements and additions will suggest themselves from time to time.

Not far from the Commission buildings is a plot of ground, which has been secured for the purpose of building a teaching and research laboratory, to be supported by those universities and colleges which do not possess any similar facilities of their own. This appears to be a very wise provision, and doubtless the Commissioner

<sup>1</sup> Originally spelt and still pronounced "Wood's Hole." The name was changed by order of the Postmaster General in 1875.